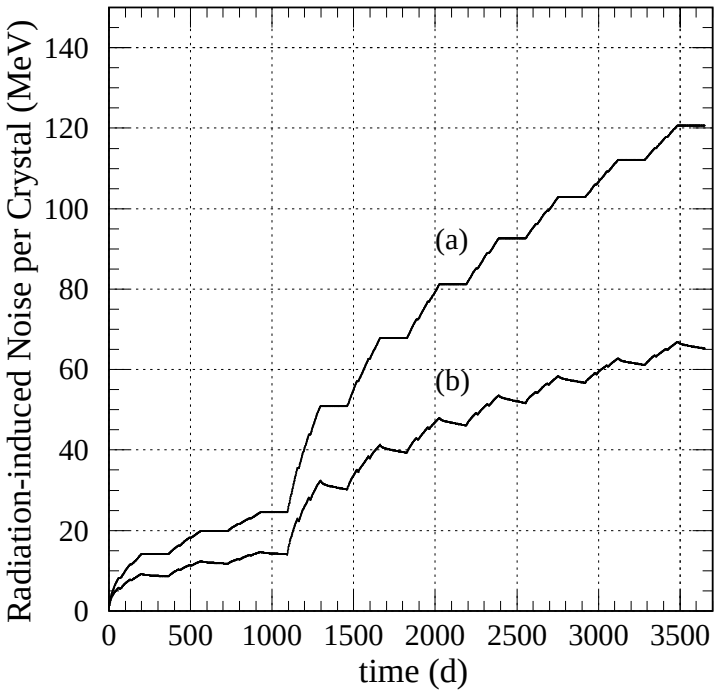
ECAL noise

- ***Current defaults values for digitization:***
  - Barrel: 30 MeV/crystal (Now as energy! - in ECAL TDR it was E_T)
  - Endcap:150 MeV/crystal
- ***No reason to believe that endcap target of 150 MeV will not be comfortably met, and no reason to suppose that it will appreciably increase during running***
- ***Barrel electronics noise is expected to be 11.5 ke***
  - Taking:
    - APD gain = 50
    - Light collected by APDs = 6 p.e./MeV (recent testbeam results)

  $\rightarrow$ 11.5k/(6x50) = 38 MeV
- ***After some years running the APD leakage current builds up (as a result of neutron damage)***
  - Figure 4.20 from ECAL TDR shows 60MeV/ crystal after 10 years
  - This effect is not included in default ORCA values...



Zero Suppression and Selective Readout

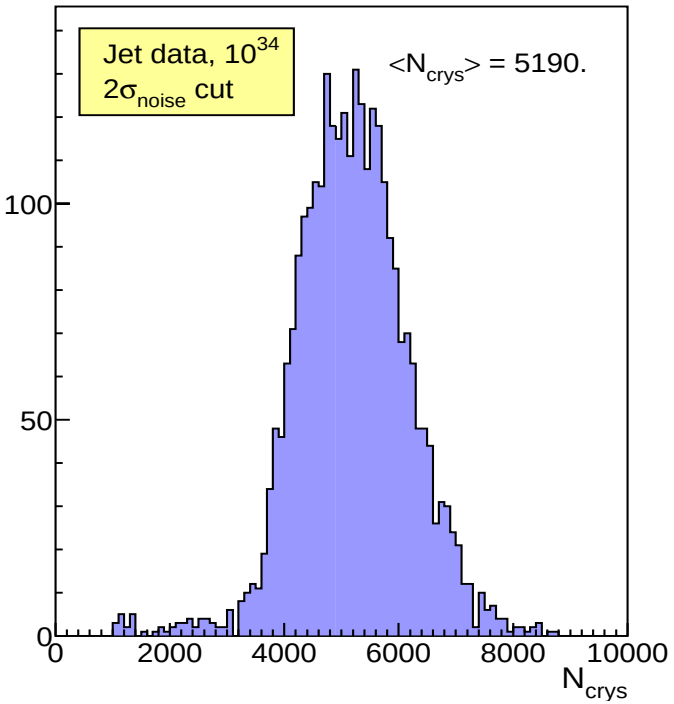
- ***Presentation on hardware capability etc by Philippe Busson can be found at:***
  http://cmsdoc.cern.ch/Physics/egamma/transparencies/m47-3.pdf

- ***Summary:***
  - Full ECAL data: 77k crystals x 10 time samples x 2 bytes ≈ 1.5 Mbytes
  - Canonical allowed data size for ECAL: 100kbytes
  - So data must be reduced by ~15

  - A central Selective Readout Manager recieves 3 bits from each trigger tower and then assigns each trigger tower a ‘readout state’ defined by 2 bits
  - The *readout state* would define options like:
    - Readout this tower with no zero suppressio
    - Readout this tower with zero suppression (with threshold at some specified level)
    - Do not readout this tower

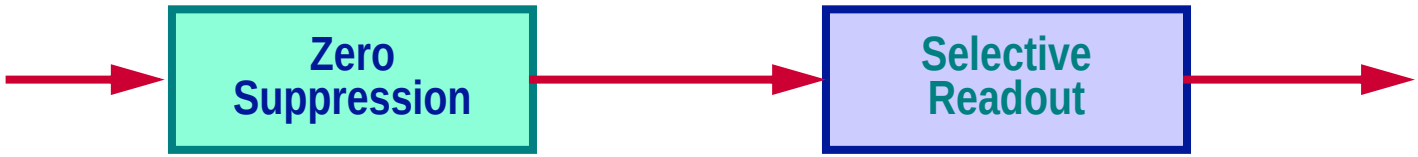
Current situation in ORCA

- ***Currently in ORCA Zero Suppression is applied with a '2 σ(noise)' cut (i.e. 60 MeV in barrel and 300 MeV in endcap)***
- ***(By chance) this gives about the factor of 15 eventually required: 6.8% crystals read out for jet events @ 10^{34}***
- ***Note also: we should not get too hypnotized by '2 σ(noise)' — the crystals passing the cut are dominated by real energy deposits, not noise! (So the cut value to give the same reduction would not scale with an increased noise level).***
- ***egamma studies are not completely happy with this algorithm because of resulting non-linearity of the energy scale***
  - — the higher the shower energy the more crystals pass the cut
  - Corrections for this can be made, but it makes understanding things more difficult than is necessary...



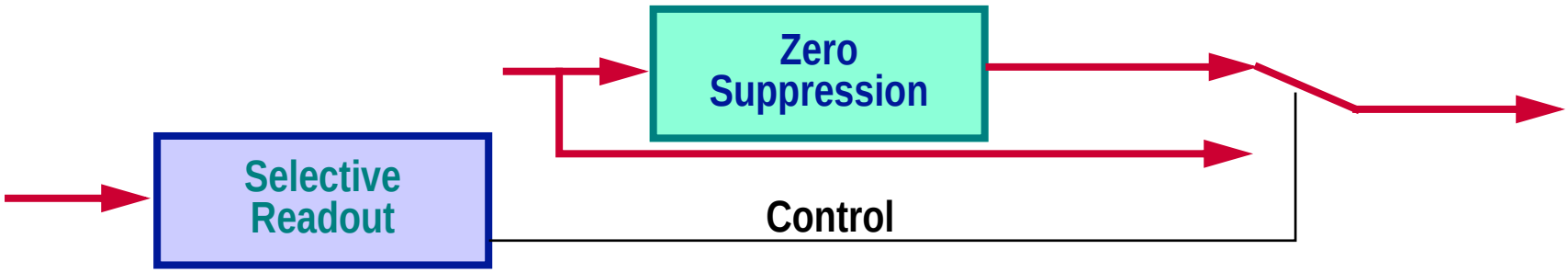
A realistic ZS/SR scenario?

- ***Most thinking in the past seems to have viewed Zero Suppression and Selective Readout as two complementary tools used additively:***



  - Zero Suppression/Selective Readout code in ORCA has been setup on this model...
    - (Hope to change this soon...)

- ***But perhaps the most promising realistic scheme would be to use Zero Suppression at some level like 2.5 σ(noise) and then use the Selective Readout to insist that towers around a high E_T tower (~ 5GeV ?) are readout without Zero Suppression***



- ***Seems fairly clear (but studies ongoing) that this would give adequate data reduction at high luminosity, and do negligible damage to egamma physics...***

- ***But what about jets and E_T^{miss} ??***